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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/711,764	10/04/2004	Toshiharu Furukawa	BUR920040152US1	5763

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EXAMINER
STARK, JARRETT J

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 04/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/711,764	FURUKAWA ET AL.	
	Examiner	Art Unit	
	Jarrett J. Stark	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03/13/2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-8,11,12,14,16-18,20 and 21* is/are rejected.

7)☒ Claim(s) *9,10,15,19,22 and 23* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *03/17/2006* 3/14/06
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

Independent claim 1 no way limits the scope of the claim to forming a structure of a IC. The breath of the claim only claims a material. The preamble of the claim is directed to an intended use for the material.

MPEP 2111.02 is directed to weight given to the preamble of claims and notes that the claim preamble must be read in the **context** of the entire claim. MEPEP 2111.02 contains more discussion and case law cites regarding this issure, and is accessible via MPEP8 (August 2001) – 2111.02 Weight of Preamble – 2100 Patentability.

The determination of whether preamble recitations ar structural limitations or mere statements of purpose or use "can be resolved only on review of the entirety of the [record] to gain an understanding of what the inventors actually invented and intended to encompass by the claim." Corning Glass Works, 868 F.2d at 1257, 9 USPQ2d at 1966. If the body of the claim fully and intrinsically sets forth all the limitations of the claimed invention, and the preamble **merely states, for example, the purpose or intended use of the invention, rather than any distinct preamble is not considered a limitation and is of no significance to claim construction.**

The claimed material, which is a fluorinated carbon nanostructure, is prior art published in US PGPUB 2004/0018138 A1 paragraphs [0034] and [0060]. For this reason the claim as presented is not patentable enforceable.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Low-K Dielectric Layer Based Upon Carbon Nanotubes.

Claim Objections

Claim 10 recites the limitation "...of claim 7, ... said copolymer...". There is insufficient antecedent basis for this limitation in the claim. The limitation of the copolymer layer is not disclosed until claim 9.

Apporpriate correction is required.

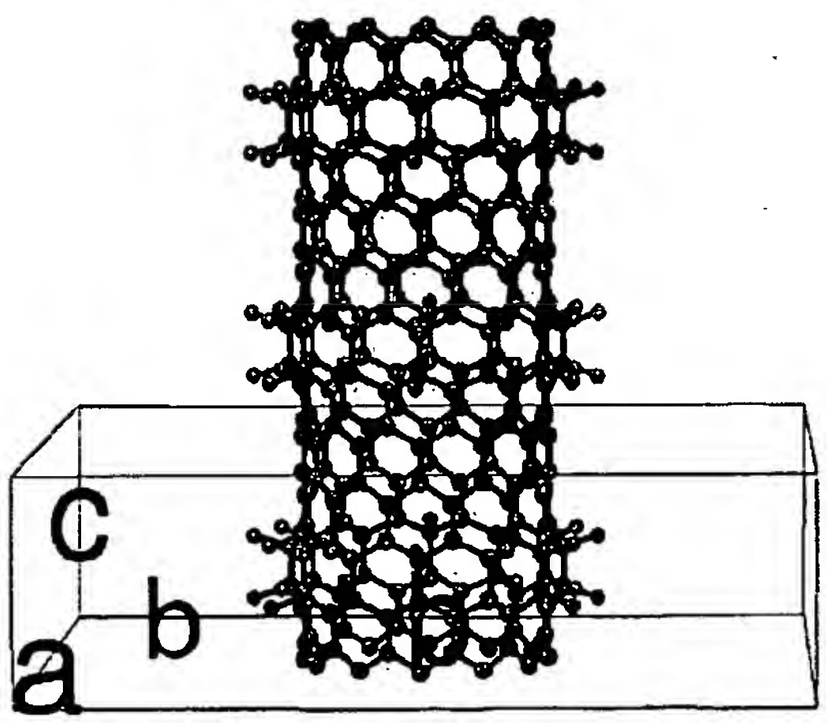
Claims 9,10, 15,19,22, and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-6 are rejected under 35 U.S.C. 102(e) as being anticipated by Hirata (US 2004/0018138 A1).



Regarding claim 1, Hirata discloses a dielectric material for forming a structure of an integrated circuit, said dielectric material comprising a plurality of carbon nanostructures. (Hirata, paragraphs [0034] and [0060])

It is inherent there is a plurality of the nanotubes produced to make the material. If one of ordinary skill in the art can produce one, it is inherent a plurality can/will be produced.

Regarding claim 2, Hirata discloses the dielectric material of claim 1 wherein said carbon nanostructures comprise a plurality of carbon nanotubes.

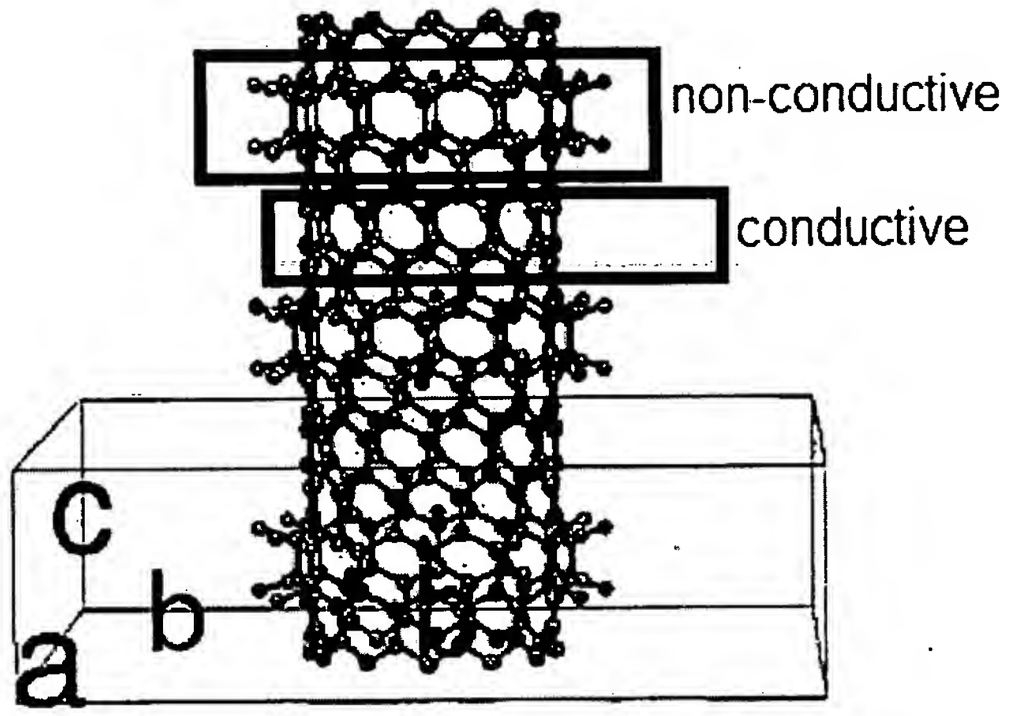
It is inherent there is a plurality of the nanotubes produced to make the material. If one of ordinary skill in the art can produce one, it is inherent a plurality can/will be produced.

Regarding claim 4, Hirata discloses the dielectric material of claim 1 wherein said dielectric material has a dielectric constant of less than about 3. (Hirata, paragraphs [0034] and [0060]) Hirata does not specifically state the dielectric characteristics of a fluorinated carbon nanotube. The materials however, **are the same**, thus it is inherent that the dielectric constant is the same in both.

Regarding claim 5, Hirata discloses the dielectric material of claim 1 wherein said structure further comprises at least one conductive feature disposed in said dielectric material.

It is inherent that there is at least one conductive feature in the dielectric material. A dielectric material is an insulator. A insulator has resistance. Resistance is the inverse of conductivity. Therefore it is inherent that any material that has any resistance feature inherently has a conductive feature.

It is also inherent that the fluorinated nanotube shown regarding claim 1 has both conductive features and resistive features due to the atomic bonding. (see figure with label below) Carbon is conductive therefore the nanotube is conductive where there is no fluorine atoms. The area with fluorine attached to the outer/inner walls of the nanotube are nonconductive.



Regarding claim 6, Hirata discloses the dielectric material of claim 1 wherein said fluorinated carbon buckyballs.

It is inherent that any carbon nanostructure consists of buckyballs. For example, nanotubes are essentially a rolled up sheet/layer of connected buckyballs. (see figure above regarding claim 1)

Regarding claim 11, Hirata discloses the semiconductor structure formed on a substrate, comprising:

a dielectric layer comprising a plurality of fluorinated carbon nanostructures; (see Hirata, Fig. 6, shown above – non-conductive area) and

at least one conductive feature in said dielectric layer (conductive area labeled above in Fig. 6), said conductive feature electrically isolated from nearby conductive features by portions of said dielectric layer.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

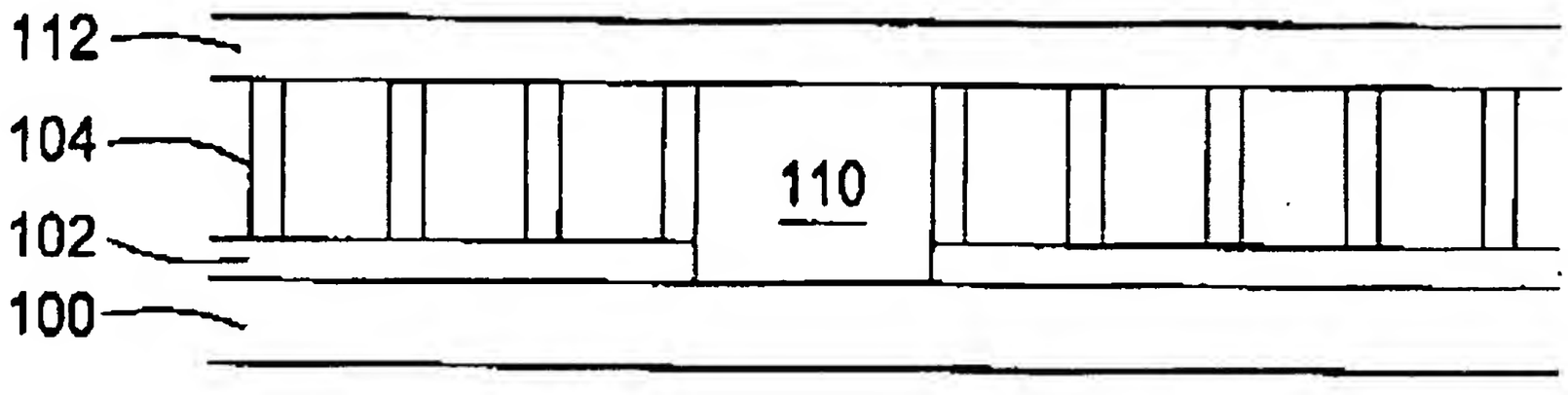
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 7, 8, 11-13, 15,16, & 18-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirata (US 2004/0018138 A1) in view of Nguyen et al. (US 2004/0169281).

Regarding claim 7, Hirata discloses the dielectric material of claim 1.

Lyons does not disclose the device further comprising a cap layer on said dielectric material.

Nguyen discloses a device made up of a low-k carbon nanotube material further comprising a cap layer on said dielectric material. (Nguyen, [0020] & Fig. 1C)

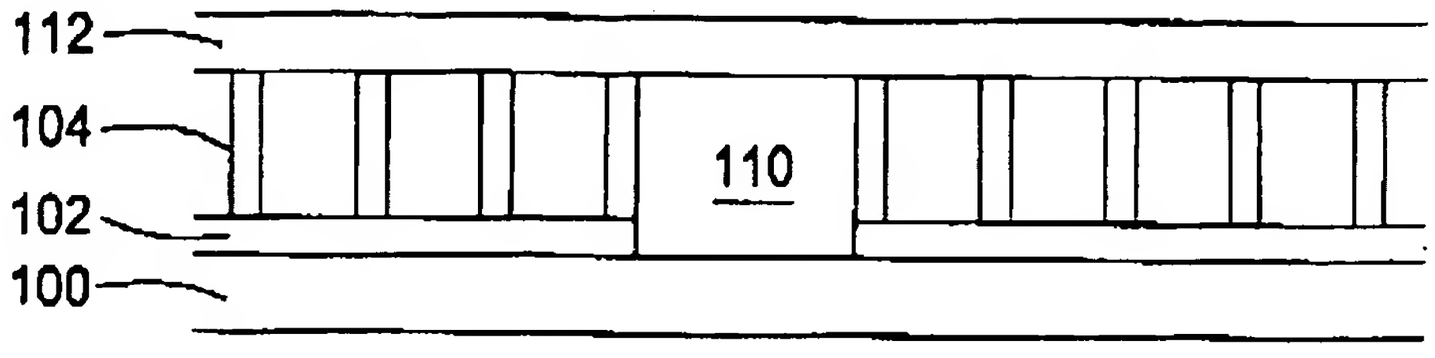


The two references are analogous art because they are from the same field of endeavor of producing a low-k dielectric layer using carbon nanotubes. Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to add a cap layer. The cap layer may be a silicon oxide layer or another dielectric layer. (Nguyen, [0035]

Regarding claim 8, Hirata in view of Nguyen disclose the dielectric material of claim 7 wherein said fluorinated carbon nanostructures and said cap layer have an effective dielectric constant of less than about 3. (see regarding claim 4)

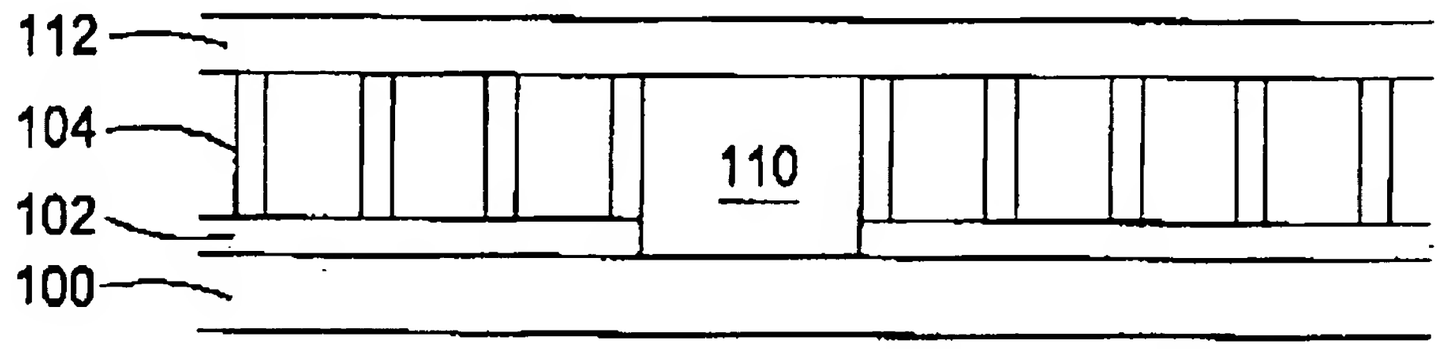
Regarding claim 12, Lyons in view of Nguyen disclose the semiconductor structure of claim 11 wherein said dielectric layer has an exposed surface, and further comprising:

a cap layer of an insulating material at least partially covering said exposed surface, said cap layer having (Nguyen Fig. 1C, 112) a top surface, and said conductive feature (Nguyen Fig. 1C, 110) having a top surface substantially coplanar with said top surface of said cap layer (Nguyen Fig. 1C, 112).



Regarding claim 14, Hirata in view of Nguyen disclose the semiconductor structure of claim 11 wherein said fluorinated carbon nanostructures comprise a plurality of carbon nanotubes. (See Hirata Figure 6)

Regarding claim 16 Hirata in view of Nguyen disclose the semiconductor structure of claim 11 wherein said structure comprises a plurality of conductors (Nguyen Fig. 1C, 110) electrically isolated by said layer of said dielectric material (Nguyen Fig. 1C, 104).



Regarding claim 17 Hirata in view of Nguyen disclose the semiconductor structure of claim 11 wherein said fluorinated carbon nanostructures comprise a plurality of fluorinated carbon bucky balls. (It is inherent that there are a plurality of fluorinated buckyballs (non-conductive region labeled on Hirata, Fig 6 shown previously – also see regarding claim 6)

Regarding claim 18 Hirata in view of Nguyen disclose the semiconductor structure of claim 11 further comprising:

a cap layer (Nguyen Fig. 1C, 112) disposed on said carbon nanostructures.

Regarding claim 20 Hirata in view of Nguyen disclose the semiconductor structure of claim 11 further comprising:

a substrate selected from the group consisting of an interconnect level, a dielectric material, a buried barrier layer, a metallization line, and a semiconductor wafer. (Nguyen Fig. 1C)

Regarding claim 21 Hirata in view of Nguyen disclose the integrated circuit comprising a plurality of circuit elements and the semiconductor structure of claim 11, said conductive feature being electrically coupled with at least one of said circuit elements. (Lyons, col. 4, lines 41-54)

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jarrett J. Stark whose telephone number is (571) 272-6005. The examiner can normally be reached on Monday - Thursday 7:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JJS

March 30, 2006

W. DAVID COLEMAN
PRIMARY EXAMINER